

SEQUENCE LISTING

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<120> IDENTIFICATION OF THE DOMAIN OF
 PLASMODIUM FALCIPARUM ERYTHROCYTE MEMBRANE PROTEIN 1
 (PFEMP1) THAT MEDIATES ADHESION TO CHONDROITIN SULFATE A

<130> NIH176.001C1

<150> PCT/US00/24195

<151> 2000-09-01

<150> 60/152,023

<151> 1999-09-01

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 His Lys Ser Leu Lys Gly Lys Gly Asn Asp Lys Tyr Asn Asp Asp Ala
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 Pro Lys Tyr Leu Lys Leu Arg Glu Asn Trp Trp Glu Ala Asn Arg Ala
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 Lys Val Trp Glu Ala Met Lys Cys Asp Ile Lys Tyr Leu Lys Asp Lys
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 Ser Gly His Gln Ser Thr Gln Ser Ser Tyr Cys Gly Tyr Ser Asp His
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 Thr Pro Leu Asp Asp Tyr Ile Pro Gln Lys Leu Arg Trp Met Thr Glu
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 Trp Ala Glu Trp Tyr Cys Lys Val Gln Lys Lys Glu Tyr Asp Lys Leu
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 Lys Glu Lys Cys Lys Glu Cys Lys Asp Lys Asp Asn Gly Gln Gly Cys
 1075 1080 1085
 Thr Lys Glu Ser Gly Thr Gly Cys Thr Lys Cys Thr Glu Ala Cys Asn
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 Glu Tyr Asn Asp Ile Ile Gly Leu Trp Lys Glu Gln Trp Asn Ile Ile
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 Ser Asp Lys Tyr Lys Glu Leu His Glu Gln Ala Gln Met Ser Val Ser
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 1155 1160 1165
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 Thr Thr Tyr Glu Asn Val Gly Ala Tyr Leu His Asp Thr Gly Asn Phe
 1185 1190 1195 1200
 Asp Asp Cys Gln Ser Gln Asn Glu Phe Cys Asp Glu Lys Ser Asp Gly
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 Lys Asp Asn Glu Lys Tyr Ala Phe Arg Asp Lys Pro Gln Asp His Asp
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 Gly Ala Cys Gly Cys Lys Ser Gly Ser Lys Pro Thr Arg Val Gln Ile
 1235 1240 1245
 Lys Thr Lys Lys Lys Ala Glu Glu Lys Asp Thr Glu Cys Lys Thr Val
 1250 1255 1260
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 1265 1270 1275 1280
 His Pro Lys Lys Asn Ser Asn Gly Tyr Pro Asp Trp Gln Cys Gly Asn



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1285 1290 1295
Ile Asn Leu Val Glu Asp Pro Arg Val Cys Met Pro Pro Arg Arg Gln
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Lys Leu Cys Val His Phe Leu Ala Asn Asp Asn Glu Ile Lys Lys Leu
1315 1320 1325
Gln Ser Gln Val Asn Leu Lys Glu Ala Phe Ile Lys Ser Ala Ala Ala
1330 1335 1340
Glu Thr Phe Phe Ser Trp Tyr Tyr Tyr Lys Ser Lys Asp Gly Glu Gly
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Asn Glu Leu Asp Lys Glu Leu Lys Glu Gly Lys Ile Pro Pro Ala Phe
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Gly Thr Asp Ile Ser Lys Gly His Gly Glu Gly Ser Lys Leu Lys Glu
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Gln Ile Asp Ser Leu Phe Lys Asn Gly Asp Gln Lys Ser Pro Asn Gly
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Lys Thr Arg Gln Glu Trp Trp Thr Glu His Ser His Glu Ile Trp Glu
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Ala Met Leu Cys Ala Leu Val Lys Ile Gly Ala Lys Lys Asp Asp Phe
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Glu Trp Tyr Asp Asp Tyr Cys Tyr Thr Arg Gln Lys Tyr Leu Lys Asp
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Val Gln Glu Lys Cys Lys Ser Asn Asp Gln Leu Lys Cys Asp Thr Glu
1505 1510 1515 1520
Cys Asn Lys Lys Cys Glu Asp Tyr Val Lys Tyr Met Lys Lys Lys Lys
1525 1530 1535
Glu Trp Ile Pro Gln Asp Lys Tyr Tyr Lys Asp Glu Arg Asp Lys Lys
1540 1545 1550
Arg Phe Asp Arg Gln His Ile Gly Val Met Val Thr Asp Tyr Thr Gly
1555 1560 1565
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1570 1575 1580
Asp Lys Pro Gly Ser Ala Ser Val Val Gln Arg Asn Ile Gln Leu Leu
1585 1590 1595 1600
Glu Lys Gln Ala Tyr Tyr Asp Ala Asp Lys His Cys Gly Cys Thr Lys
1605 1610 1615
Phe Ile Glu Asn Asp Asp Lys Tyr Thr Asn Ile Ser Ser Lys Asp Lys
1620 1625 1630
Cys Lys Gly Leu Val Lys Glu Ala Asn Thr Gly Ala Ile Lys Trp Gln
1635 1640 1645
Asn Lys Gly Pro Asn Asn Tyr Asn Asn Leu Lys Glu Leu Thr Glu Asp
1650 1655 1660
Val Leu Phe Pro Ser Arg Arg Leu Arg Ile Cys Phe His Ala Leu Asp
1665 1670 1675 1680
Gly Asn Tyr Thr Asp Pro Glu Val Lys Asp Glu Asn Gly Leu Arg Lys
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Arg Leu Met Glu Val Ala Ala Thr Glu Gly Tyr Asn Leu Gly Gln Tyr
1700 1705 1710
Tyr Lys Glu Lys Lys Glu Lys Glu Lys Ile Lys Thr Ser Asp Ala His
1715 1720 1725

Lys Tyr Ser Tyr Glu Val Pro Pro Cys Ser Ala Met Lys Tyr Ser Phe
 1730 1735 1740
 Tyr Asp Leu Arg Asp Ile Ile Leu Gly Ile Asp Asn Leu Glu Asp Glu
 1745 1750 1755 1760
 Lys Gln Lys Thr Glu Glu Asn Leu Lys Lys Ile Phe Asn Lys Asn Gly
 1765 1770 1775
 Thr Ser Val Gly Lys Gly Ser Asp Ser Thr Thr Gly Asn Pro Gly Ser
 1780 1785 1790
 Thr Ala Arg Lys Phe Phe Trp Asn Glu Asn Lys Glu Cys Val Trp Asn
 1795 1800 1805
 Ala Met Ile Cys Gly Tyr Lys Arg Gly Arg Asp Asp Gly Asn Ser Gly
 1810 1815 1820
 Asn Ser Ala Arg Ser Asp Glu Asp Leu Lys Lys Cys Gly Ser Val Pro
 1825 1830 1835 1840
 Ser Asp Asp Asp Tyr Pro Met Gly Lys Asn Arg Asp Glu Gly Thr Ala
 1845 1850 1855
 Tyr Gln Phe Leu Arg Trp Phe Ala Glu Trp Gly Glu Asp Phe Cys Lys
 1860 1865 1870
 His Lys Glu Lys Glu Leu Glu Lys Leu Val Gly Ala Cys Asn Asp Tyr
 1875 1880 1885
 Thr Cys Gly Asp Asn Glu Asp Lys Arg Lys Lys Cys Thr Asp Ala Cys
 1890 1895 1900
 Thr Gln Tyr Lys Lys Phe Ile Ser Glu Trp Lys Pro Gln Tyr Glu Lys
 1905 1910 1915 1920
 Gln Ile Lys Lys Tyr Gly Glu Asn Lys Asp Lys Ile Tyr Ser Glu His
 1925 1930 1935
 Pro Val Ala Lys Asp Ala Glu Asp Ala Arg Glu Tyr Leu Asp Lys Gln
 1940 1945 1950
 Leu Lys Lys Ile Cys Glu Asn Lys Ser Gly Asp Cys Glu Tyr Lys Cys
 1955 1960 1965
 Met Lys Asp Val Ser Thr Gln Arg Leu Thr Asp Gly Asn Ser Gln Asn
 1970 1975 1980
 Met Pro Ala Ser Leu Asp Asp Glu Pro Lys Glu Val Glu Gly Lys Cys
 1985 1990 1995 2000
 Asn Cys Gln Val Pro Arg Gly Pro Pro Arg Val Arg Arg Glu Thr Pro
 2005 2010 2015
 Ser Pro Arg Val Ser Leu Ile Ser Lys Ala Thr Ala Ser Lys Lys Glu
 2020 2025 2030
 Ala Lys Thr Ala Pro Pro Thr Lys Gln Pro Lys Lys Val Glu Asn Leu
 2035 2040 2045
 Thr Thr Glu Met Arg Ala Gln Thr Arg Thr Arg Arg Ala Ala Gln Gln
 2050 2055 2060
 Thr Arg Lys Arg Thr Ser Thr Ala Thr Thr Thr Glu Ser Asp Val Gly
 2065 2070 2075 2080
 Thr Met Val Lys Ala Ile Leu Ser Asn Lys Pro Asp Ser Arg Gly Gly
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 Ile Glu Gly Cys Asn Pro Lys Thr Tyr Gly Gln Tyr Pro Lys Trp Gly
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 Cys Ile Val Gly Lys Ser Lys Glu Asn Glu Asn Gly Ile Cys Met Pro
 2115 2120 2125
 Pro Arg Arg Lys Lys Leu Cys Ile Asn Asn Ile Gln Tyr Leu Asn Tyr
 2130 2135 2140
 Glu Thr Glu Asn Lys Arg Asp Asn Asp Ile Lys Glu Ala Phe Ile Lys
 2145 2150 2155 2160
 Cys Ala Ala Ile Glu Thr Gln Phe Leu Trp Leu Lys Tyr Ile Ile Glu

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Asn Pro Ala Ala Glu Asn Glu Leu Gln Asn Gly Thr Ile Pro Asp Glu		
2180	2185	2190
Phe Lys Arg Ile Met Tyr Tyr Thr Tyr Gly Asp Tyr Lys Asp Met Phe		
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Phe Gly Thr Asp Ile Ser Asn Asp Lys Lys Ile Ile Thr Val Thr Asn		
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Ser Val Thr Thr Ile Leu Asn Glu Asn Asn Lys Lys Lys Gln Asp Lys		
2225	2230	2235
Lys Lys Asp Glu Glu Leu Arg Lys Ile Phe Trp Glu Lys Asn Lys Lys		
2245	2250	2255
Phe Ile Trp Glu Gly Met Ile Tyr Gly Leu Thr Tyr His Leu Thr Asp		
2260	2265	2270
Glu Asn Glu Lys Glu Lys Ile Arg Asp Asn Tyr Gln Tyr Asn Asp Met		
2275	2280	2285
Thr Lys Leu Thr Pro Ser Leu Glu Glu Phe Val Lys Arg Pro Gln Phe		
2290	2295	2300
Leu Arg Trp Phe Thr Glu Trp Ala Glu Glu Phe Cys Asn Lys Arg Lys		
2305	2310	2315
Glu Gln Leu Leu Lys Leu Glu Ala Gly Cys Lys Glu Tyr Glu Cys Asn		
2325	2330	2335
Gly Ser Asn Asp Gly Lys Thr Gln Glu Cys Ala Glu Ala Cys Val Thr		
2340	2345	2350
Tyr Gln Asn Phe Ile Lys Lys Trp Lys Thr Glu Tyr Glu Arg Gln Arg		
2355	2360	2365
Glu Lys Phe Lys Lys Asp Lys Asp Gly Lys Lys Tyr Lys Asp Tyr Pro		
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Ser Thr Glu Arg Asp Ile Glu Lys Ala Thr Cys Ala His Glu Tyr Leu		
2385	2390	2395
Asn Met Lys Leu Lys Glu Leu Cys Gly Asn Lys Asp Cys Ser Cys Met		
2405	2410	2415
Gln Lys Pro Ser Ser Gln Leu Pro Lys Thr Thr Gln Gln Ser Gln Ser		
2420	2425	2430
Ser Asp Ala Asn Asp Met Pro Glu Ser Leu Asp Tyr Val Pro Glu Glu		
2435	2440	2445
Phe Asn Lys Cys Glu Cys Pro Glu Leu Ser Lys Lys Gly Ser Met Ile		
2450	2455	2460
His Thr Lys Lys Ile Thr Glu Pro Lys Ile Pro Met Asn Cys Val Glu		
2465	2470	2475
Lys Ala Ala Tyr Tyr Leu Ser Lys Glu Ala Glu Asn Asn Met Asp Ile		
2485	2490	2495
Thr Leu Lys Glu Lys Phe Ile Pro Ile Glu Ser Thr Lys Glu Lys Glu		
2500	2505	2510
Ser Lys Asn Ser Trp Thr Asn Asn Asn Pro Cys Asp Pro Lys Lys Pro		
2515	2520	2525
Tyr Ala Pro Asp Lys Tyr Ile Gly Arg Arg Asn Pro Cys Glu Asn Arg		
2530	2535	2540
Glu Glu Asn Arg Phe Lys Val Asp Tyr Glu Trp Lys Cys Tyr Lys Asn		
2545	2550	2555
Ser Lys Phe Tyr Gln Glu Lys Lys Arg Val Cys Val Pro Pro Arg Arg		
2565	2570	2575
Glu His Met Cys Leu Arg Asn Leu Asp Glu Ile Lys Ile Glu Arg Leu		
2580	2585	2590
Lys Asp Ser Asn Tyr Leu Leu Lys Met Val Arg Arg Thr Ala Arg Asn		
2595	2600	2605

Arg Asp Leu Tyr Thr Gly Lys Glu Ile Ser Tyr Asn Ile Asn Met Ser
 3490 3495 3500
 Thr Asn Thr Asn Asn Asp Ile Pro Met Asn Ala Arg Asn Asp Ser Tyr
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 Arg Gly Ile Asp Leu Ile Asn Asp Ser Leu Val Val Leu Asn Leu Leu
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 Ile Tyr Met Met Lys Tyr
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 Arg Gln Met Phe Tyr Thr Phe Gly Asp Tyr Arg Asp Ile Leu Phe Gly
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 <213> Plasmodium falciparum
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 Lys Glu Leu Lys Glu Gly Lys Ile Pro Glu
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<210> 5
 <211> 4
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 <213> Plasmodium falciparum

<400> 5
 Lys Glu Gly Lys
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<210> 6
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 <213> Plasmodium falciparum

<220>
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<221> VARIANT
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Asn Gly Gln Asp Gly Thr Lys Lys Ile Glu Glu Cys Asn Thr Lys Tyr
1 5 10 15
Tyr Pro Thr Lys Asn Asp Tyr Pro Gly Trp Asn Cys Thr Asp Lys Val
20 25 30
Ile Asn Arg Glu Glu Gly Ser Cys Met Pro Pro Arg Arg Gln Lys Leu
35 40 45
Cys Ile His Asn Leu Glu His Leu Ser Glu Lys Ala Thr Glu Thr Glu
50 55 60
Leu Arg Lys Ala Phe Ile Glu Cys Ala Ala Ile Glu Thr Phe Trp Leu
65 70 75 80
Trp Asp Lys Tyr Lys Glu Asp Lys Lys Asp Glu Lys Lys Thr Glu Gly
85 90 95
Gly Gly Ile Ser Asp Asp Pro Asp Asp Pro Gln Lys Lys Leu Glu Gly
100 105 110
Gly Thr Ile Pro Glu Asp Phe Lys Arg Gln Met Phe Tyr Thr Tyr Gly
115 120 125
Asp Tyr Arg Asp Phe Leu Phe Gly Thr Asp Ile Ser Lys Gly His Gly
130 135 140
Lys Glu Ser Ala Leu Gly Lys Lys Ile Asp Ser Leu Phe Lys Asn Gly
145 150 155 160
Asp Gln Lys Ser Pro Ser Gly Lys Thr Pro Thr Glu Trp Trp Asn Asp
165 170 175
Tyr Gly Pro Asp Ile Trp Lys Gly Met Val Cys Gly Leu Ser His His
180 185 190
Ile Lys Asn Gly Asn Lys Glu Gln Leu Arg Lys Asn Leu Thr Asp Asn
195 200 205
Asn Lys Tyr Thr Lys Ile Ser Ser Lys Leu Glu Asp Phe Ala Ser Arg
210 215 220
Pro Gln Phe Leu Arg Trp Phe Ile Glu Trp Gly Asp Gln Phe Cys Arg
225 230 235 240
Glu Arg Val Val Lys Ile Asn Gln Leu Lys Thr Gly Cys Asn Glu Tyr
245 250 255
Glu Cys Gly Ser Gln Glu Asn Gly Lys Lys Glu Ala Cys Lys Asn Ala
260 265 270
Cys Glu Ala Tyr Lys Ser Trp Leu Lys Asp Trp Lys Asp Gln Tyr Glu
275 280 285
Gln Gln Thr Ala Lys Phe Asp Lys Asp Lys Lys Asp Lys Lys Phe Asp
290 295 300
Gly Thr Ser Ala Glu Val Asp Val Ala Ala Val Ser Ser Val His Glu
305 310 315 320
Tyr Leu Gln Glu Glu Leu Lys Asn Leu Cys Thr Lys Gly Asp Cys Ala
325 330 335
Cys Met Glu Lys Pro Ser Ala Gln Asp Glu Glu Thr Glu Leu Leu Gly
340 345 350
Gly Asn Tyr Phe Pro Glu Ala Met Asp Tyr Pro Pro Lys Glu Ile Gly
355 360 365
Glu Arg Cys Lys Cys Ala Ile Pro Ser Glu Pro Met Ser Cys Val Glu
370 375 380
Gln Ile Ala Lys His Leu Arg Glu Lys Ala Glu Lys Asn Val Lys Ile
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Tyr Glu Ser Ser Leu Lys Gly
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<211> 351

<212> PRT

<213> Plasmodium falciparum

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35 40 45
Gln Asn Leu Cys Val His Tyr Leu Thr Lys Leu Asn Asp Asp Ser Lys
50 55 60
Glu Glu Asp Leu Arg Glu Ala Phe Ile Lys Ser Ala Ala Ala Glu Thr
65 70 75 80
Phe Leu Leu Arg Gln Tyr Tyr Asn Ser Lys Asn Val Glu Asp Asp Lys
85 90 95
Ile Leu His Arg Asp Met Ile Pro Pro Glu Phe Phe Arg Ser Met Phe
100 105 110
Tyr Thr Phe Gly Asp Tyr Arg Asp Ile Cys Leu Asp Thr Asp Ile Ser
115 120 125
Glu Lys Ile Ala Asp His Asp Val Thr Thr Ala Lys Lys Lys Ile Thr
130 135 140
Ala Val Phe Gln Lys Ile Gly Ser Lys Thr Thr Asn Gly Lys Lys Val
145 150 155 160
Leu Glu Arg Glu Gly Trp Trp Lys Glu Tyr Gly Leu Ser Ile Trp Lys
165 170 175
Gly Met Leu Cys Ala Leu Ser Tyr Asn Thr Glu Thr Lys Lys Met Asp
180 185 190
Glu Gly Val Arg Thr Tyr Leu Met Lys Tyr Ile Tyr Lys Asn Asn Asp
195 200 205
Ile Lys Glu Tyr Leu Glu Glu Phe Ala Ser Arg Pro Pro Phe Leu Arg
210 215 220
Trp Val Thr Glu Trp Gly Glu Asp Phe Val Lys Asn Arg Lys Lys Glu
225 230 235 240
Leu Val Ser Leu Lys Lys Lys Cys Asp Ser Cys Thr Leu Arg Asn Asn
245 250 255
Gly Thr Ser Asn Lys Thr Cys Asp Asp Asn Glu Asn Cys Gly Ala Cys
260 265 270
Lys Thr Gln Cys Glu Lys Tyr Lys Lys Trp Met Glu Arg Trp Lys Lys
275 280 285
His Tyr Ser Ser Gln Lys Lys Lys Phe Gln Leu Tyr Lys Asn Ser Ala
290 295 300
Thr Tyr Asn Asn Gly Leu Ala Val Lys Glu Ala Asn Ser Glu Thr Tyr
305 310 315 320
Lys Asn Asp Pro Glu Val Thr Glu Ala Asn Ser Ala Lys His Ala Arg
325 330 335
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340 345 350

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 Asn Gly Ala Cys Met Pro Pro Arg Arg Gln Lys Leu Cys Val Ser Gly
 35 40 45
 Leu Thr Lys Thr Asp Arg Ile Lys Ala Ile Glu Tyr Ile Arg Thr Glu
 50 55 60
 Phe Ile Lys Ser Ala Ala Ile Glu Thr His Phe Ala Trp Asp Arg Tyr
 65 70 75 80
 Lys Glu Asp Asn Gly Glu Ala Glu Ala Glu Leu Lys Asn Gly Asn Ile
 85 90 95
 Pro Glu Gly Phe Lys Arg Gln Met Tyr Tyr Thr Phe Gly Asp Tyr Arg
 100 105 110
 Asp Ile Phe Phe Gly Arg Asp Ile Ser Thr His Ala Tyr Ile Ser Gly
 115 120 125
 Val Ser Pro Lys Val Ile Thr Ile Leu Glu Lys Glu Asn Asp Ala Lys
 130 135 140
 Tyr Ala Ala Lys Gln Asn Ser Asn Asn Glu Leu Leu Asp Asp Trp Trp
 145 150 155 160
 Asp Gln His Gly Lys Asp Ile Trp Glu Gly Met Leu Cys Ala Leu Thr
 165 170 175
 His Lys Ile Ser Asp Glu Glu Lys Lys Lys Glu Ile Lys Asn Lys Tyr
 180 185 190
 Ser Tyr Lys Lys Leu Asn Glu Ser Pro Lys Gly Ser Asn Lys Val Glu
 195 200 205
 Asp Phe Ala Lys Lys Pro Gln Phe Leu Arg Trp Phe Ile Glu Trp Gly
 210 215 220
 Asp Glu Phe Cys Ala Gln Arg Glu Glu Lys Glu Ala Lys Val Lys Val
 225 230 235 240
 Ser Cys Ser Asp Ala Lys Asp Tyr Asp Gly Cys Lys Asn Thr Lys Ser
 245 250 255
 Asn Ala Ser Cys Val Ser Ala Cys Lys Val Tyr Glu Asp Tyr Ile Thr
 260 265 270
 Lys Lys Lys Val Glu Tyr Thr Lys Gln Lys Gly Lys Phe Asp Ala Glu
 275 280 285
 Lys Ile Thr Asp Lys Glu Gly Tyr Glu Gly Phe Ser Thr Lys Asp Ala
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 Ser Glu Tyr Leu Lys Lys Lys
 305 310

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<400> 11

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 Ala Cys Met Pro Pro Arg Arg Gln Lys Leu Cys Val Arg Asp Leu Thr
 35 40 45
 Gln Gly Gly Glu Ile Arg Lys Pro Glu Asp Ile Leu Thr Lys Phe Ile
 50 55 60
 Asn Cys Ala Ala Lys Glu Thr His Phe Ala Trp His Lys Tyr Lys Lys
 65 70 75 80
 Asp Asn Val Asn Ala Glu Asn Glu Leu Lys Ser Gly Lys Ile Pro Glu
 85 90 95
 Gly Phe Arg Lys Gln Met Tyr Tyr Thr Phe Gly Asp Phe Arg Asp Ile
 100 105 110
 Phe Phe Gly Thr Asp Ile Ser Ser Cys Arg Tyr Ile Lys Asp Thr Ser
 115 120 125
 Gln Thr Ile Lys Ser Lys Leu Gly Asp Gln Ala Thr Thr Glu Lys Gly
 130 135 140
 Asp Thr His Ile Asp Asp Asn Lys Lys Leu Gln Glu Trp Trp Thr Ile
 145 150 155 160
 His Gly Pro Lys Ile Trp Glu Gly Met Leu Cys Ala Leu Thr Asn Gly
 165 170 175
 Leu Ser Glu Ser Glu Lys Lys Asn Ile Leu Gln Asp Tyr Ser Tyr Asn
 180 185 190
 Lys Leu Asn Asn Ala Glu Lys Asp Asp Cys Cys Leu Glu Lys Phe Ala
 195 200 205
 Ser Lys Pro Gln Phe Leu Arg Trp Tyr Val Glu Trp Ser Asp Glu Phe
 210 215 220
 Cys Arg Glu Arg Lys Lys Leu Glu Asp Lys Val Glu Asp Val Cys Ile
 225 230 235 240
 Lys Ala Lys Asp Tyr Glu Gly Cys Lys Asn Asn Lys Ser Asn Asn Ser
 245 250 255
 Cys Val Lys Val Cys Lys Glu Tyr Glu Asn Tyr Ile Thr Gly Lys Lys
 260 265 270
 Thr Gln Tyr Glu Ser Gln Glu Gly Lys Phe Asn Thr Glu Lys Arg Gln
 275 280 285
 Lys Lys Pro Glu Tyr Asn Ser Tyr Ser Lys Lys Asp Ala Ser Glu Tyr
 290 295 300
 Leu Lys Asp Lys
 305